Space Weather Forecast

Issued on Sunday, 18 December 2022 at 01:00 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate-class X-ray flares likely. Slight chance of Minor Geomagnetic Storms throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with peak activity being a Moderate-class X-ray flare seen at 17/1953UTC from a sunspot near the northeastern solar horizon. There are currently eight sunspot regions on the Earth-facing side of the Sun, with most magnetically 'unipolar' and stable. More significantly, a large region now no longer visible in the southwest was replaced by new arrivals in the east that are very likely hiding some complexity (due to the narrow viewing angle).

A flare from near AR3166 around 17/0900UTC did not obviously result in any ejecta on satellite imagery in the period. There were otherwise three events noted: firstly a possible faint Coronal Mass Ejection (CME) seen heading largely westwards after a minor Common-class X-ray flare around 17/1545UTC. This event has been analysed but results are not available at the time of writing. Initial thoughts are that any influence would be minor - if present at all. A second more impulsive event was tied to the Moderate-class flare. Corroborating imagery is only just becoming available and analysis will be conducted shortly. Again, any Earth-based trajectory is thought marginal at worst. Thirdly and finally, a dimming from a common-class flare in the northewest around 17/2200UTC has yet to appear on imagery but is being watched for. No new Earth-directed CMEs are therefore confirmed at the time of writing.

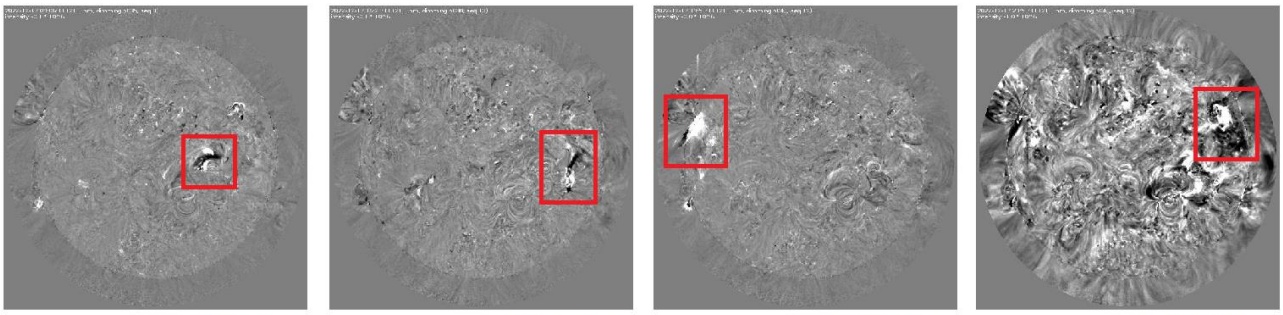

Figure 1: Roster of extreme UV time-integrated ‘coronal dimmings’ (processing by SIDC ROB). None as yet has been confirmed as having generated any Earth-directed CMEs, with analysis ongoing.

Solar Wind / Geomagnetic Activity: Measurement of solar winds suffered an outage for the first six hours of the 24-hour reporting window, but on the evidence available have followed a slow regime.

The solar wind speed was erratic but showed a downward trend in the normal background range.

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Both the number of particles and their associated magnetic field were also stable and near the long-term average, with no prolonged alignment or anti-alignment with Earth's field.

The net result of the above solar wind measures was for provisionally quiet geomagnetic activity throughout, well below Minor Geomagnetic Storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be moderate, particularly for the remainder of the UTC weekend and perhaps the very start of the UTC working week, with a large sunspot then due to rotate off the facing side. A new arrival in the east appears to be capable of similar levels of activity however, and far side soundings as well as recent far-sided CMEs suggest that there may be a large region nearing the northeastern solar horizon into the UTC week, perhaps preserving the risk of further Moderate-class flares.

Solar Wind / Geomagnetic Activity: Two CMEs may give slight glancing impacts on Sunday 18 and Monday 19 December, although confidence in this aspect of the forecast is notably low.

Otherwise, solar winds are expected to follow a slow regime initially, perhaps becoming slightly elevated as a fast wind potentially affects Earth on day one, Sunday 18 December. A second fast wind may then feature from midweek UTC.

The above combination of low confidence CME activity and two successive fast wind streams should combine to give a daily slight chance of Minor geomagnetic storm G1, with Tuesday 20 December perhaps offering the best chance of favourable conditions.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, however there is slight chance of S1 level storms with the occurrence of any notable flares, especially while a large sunspot crosses the best-connecting western solar horizon (with Earth should a proton-rich X-ray flare event occur).

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	10	5	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

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X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	Yes	70	70	60	60
Very Active	**R3 to R5 X**	No	15	15	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	15	15	10	10
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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